CLAIMS

What is claimed is:

Claim 1. A kit for creating a spinal fixation assembly comprising:

a polyaxial bone screw having a first end constructed and arranged for threaded engagement in a spinal bone by application of an effective amount of rotational torque, and a second end constructed and arranged for swivelable attachment of a linking member, said linking member having a first end constructed and arranged for attachment of a connecting member and a second machined end constructed and arranged for swivelable attachment to said second end of said bone screw;

a connecting member constructed and arranged for adjustable positioning about said linking member machined end; and

a linear fastener constructed and arranged to provide positive compressive attachment of said connecting member and said linking member machined end;

whereby application of a non-rotational, linear force to said linear fastener fixedly engages said fastener about said linking member machined end to produce and maintain clamping force effective to produce a spinal fixation assembly having a fixed orientation.

Claim 2. The spinal fixation assembly kit of claim 1 wherein said bone-screw member has a substantially-spherical second end, said spherical external end having a surface which is constructed and arranged to cooperate with a support collar, said support collar including a substantially spherical first surface and a generally flat second surface, whereby engagement of a linear engaging fastener supplies a clamping force to said support collar for locking said linking element in a chosen orientation.

Claim 3. The spinal fixation assembly kit of claim 2 wherein said linear fastener includes;

a collet member having a base end, a top end, an inner engaging surface, and an outer tapered compression surface positioned about a central axis;

a compression ring member having a base end, a front end, an inner tapered compression surface, and an outer surface positioned about a central axis;

wherein said inner tapered compression surface of said compression ring member is constructed and arranged for coaxial alignment and overlapping engagement with respect to said outer tapered compression surface of said collet member, said compression ring member linearly traversable with respect to said outer tapered surface of said collet member between a

first release position and a second engaged position, wherein said collet member is placed over said first end of said linking element in said first release position and wherein said engaged position results in said cooperating tapered surfaces compressing said collet member and tensilely loading said compression ring member thereby supplying said clamping force and gripping the outer surface of said linking element.

Claim 4. The spinal fixation assembly kit of claim 3 wherein said first end of said linking member includes a tensioning means; wherein said tensioning means is constructed and arranged to allow said linking member to be tensilely loaded prior to linear traversal of said compression ring member to said engagement position with respect to said collet member.

Claim 5. The spinal fixation assembly kit of claim 4 wherein said tensioning means includes at least one groove extending around the circumference of said first end of said linking element, wherein said at least one groove is constructed and arranged for gripping and placing a tensile load on said linking member prior to linear traversal of said compression ring member into said engagement position with respect to said collet member.

Claim 6. The spinal fixation assembly kit of claim 4 wherein said linking member tensioning means includes at least one internal bore extending inwardly from said first end along the longitudinal centerline of said linking member, wherein said at least one internal bore is constructed and arranged for gripping and placing a tensile load on said linking member prior to linear traversal of said compression ring member into said engagement position with respect to said collet member.

Claim 7. The spinal fixation assembly kit of claim 6 wherein said internal bore includes threads.

Claim 8. The spinal fixation assembly kit of claim 4 wherein said tensioning means includes a frangible stem, whereby said frangible stem is severed from said first end of said linking element when said linking element reaches a predetermined tension, wherein said frangible stem is severed subsequent to linear traversal of said compression ring member into said engagement position with respect to said collet member.

Claim 9. The spinal fixation assembly kit of claim 1 wherein said first end of said bone-engaging member has screw threads to engage said bone.

Claim 10. In an anchoring assembly for use with a spinal fixation system, said spinal fixation system including at least one spine stabilizing rod and at least one connector adapted to selectively engage said at least one stabilizing rod;

a linking member having a machined first end and a substantially-spherical second end, said machined first end being sized to engage said connector;

a bone-engaging member having a first end adapted to engage said bone and a second end comprising a retention cavity constructed and arranged to engage said linking member second end, said retention cavity having a substantially-spherical exterior surface;

a linear engaging fastener means for attaching said linking member first end to said connector;

whereby said linear engaging fastener prevents relative motion between said anchoring assembly and said connector once said anchoring assembly and said connector have been arranged in a spinal-curve-correcting orientation and said linear engaging fastener has been engaged without applying rotational torque to said assembly.

Claim 11. The anchoring assembly for use with a spinal fixation system of claim 10 wherein said linear engaging fastener includes;

a collet member having a base end, a top end, an inner engaging surface, and an outer tapered compression surface positioned about a central axis; and

a compression ring member having a base end, a front end, a inner tapered compression surface, and an outer surface positioned about a central axis;

wherein said inner tapered compression surface of said compression ring member being constructed and arranged for coaxial alignment and overlapping engagement with respect to said outer tapered compression surface of said collet member, said compression ring member linearly traversable with respect to said outer tapered surface of said collet member between a first release position and a second engaged position, wherein said collet member is placed over said first end of said linking member in said first release position and wherein said engaged position results in said cooperating tapered surfaces compressing said collet member and tensilely loading said compression ring member thereby supplying said clamping force and gripping the outer surface of said linking member.

Claim 12. The anchoring assembly of claim 11 wherein said first machined end of said linking member includes a tensioning means; wherein said tensioning means is constructed and arranged to allow said linking member to be tensilely loaded

prior to linear traversal of said compression ring member to said engagement position with respect to said collet member.

Claim 13. A method of constructing internal and external surgical appliances using a plurality of polyaxial bone anchoring assemblies, a plurality of connectors, and at least one stabilizing rod wherein said appliances are assembled without application of rotational torque to said polyaxial bone anchoring assemblies, said method comprising the steps of:

supplying at least one bone-engaging member having a first end adapted to engage said bone and a second end comprising a substantially-spherical exterior surface, said second end including a generally spherical retention cavity constructed and arranged to engage a linking member;

supplying at least one linking member having a machined first end and a substantially-spherical second end, whereby said second end of said linking member is secured within said spherical retention cavity to allow swivelling movement in relation to said bone-engaging member;

supplying at least one auxiliary connector, said connector constructed and arranged for attachment to at least one stabilizing rod to prevent unwanted movement between said bone-engaging members;

supplying at least one stabilizing rod, wherein said stabilizing rods are rigid members shaped to form a correcting path, wherein said stabilizing rod has a sufficient length to span between at least two of said polyaxial bone anchoring assemblies;

supplying a support collar for each of said linking members, said support collars having a centrally located passthrough aperture, a first upper surface and a second lower surface, said second lower surface constructed and arranged to cooperate with said exterior surface of said second end of said bone engaging member, said first upper surface constructed and arranged to cooperate with said at least one auxiliary connector;

supplying at least one linear engaging fastener means, said linear fastening means being constructed and arranged for coaxial alignment and overlapping engagement with respect to said second machined end of said linking member, said linear fastening means linearly traversable with respect to said second machined end of said linking member between a first release position and a second engaged position, wherein said linking member is placed over said second machined end of said linking member, wherein said engaged position results in tensilely loading said linking member and thereby supplying a

clamping force for gripping said machined end of said linking member.

Claim 14. A process for creating a spinal fixation assembly comprising:

providing a polyaxial bone screw having a first end constructed and arranged for threaded engagement in a spinal bone by application of an effective amount of rotational torque, and a second end constructed and arranged for swivelable attachment of a linking member, said linking member having a first end constructed and arranged for attachment of a connecting member and a second machined end constructed and arranged for swivelable attachment to said second end of said bone screw;

providing a connecting member constructed and arranged for adjustable positioning about said linking member machined end; and

providing a linear fastener constructed and arranged to provide positive compressive attachment of said connecting member and said linking member machined end;

applying a non-rotational, linear force to said linear fastener effective to fixedly engage said fastener about said anchoring element proximal end to produce and maintain a

clamping force effective to produce a spinal fixation assembly having a fixed orientation;

wherein said linking element is fixedly engaged about said anchoring element without the application of rotational torque.